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EDITOR

Diphtheria Control Measures*

By W. H. KELLOGG, M.D., Chief, Bureau of Laboratories

Immunization Against Diphtheria.

The diphtheria bacillus when growing on artificial media as when growing in the throat of a victim elaborates a powerful toxic poison. When horses are injected with progressively increasing doses of diphtheria toxin they develop an active antitoxic immunity. Their blood contains antitoxin which has the property of neutralizing toxin. The clear serum from the blood of immunized horses, when properly purified and standardized, becomes the well known diphtheria antitoxin. Besides being valuable in the treatment of diphtheria, antitoxin may be used to prevent known contacts of cases from contracting the disease. This use of diphtheria antitoxin (called passive immunization because immunity is merely borrowed from the horse) is subject to certain limitations that should be generally understood. When one thousand units of antitoxin are given to a child living in a family where a case of diphtheria exists, he is completely protected at once, but unfortunately the duration of the passive immunity is only ten to fourteen days. The original case in this family may be completely recovered at the end of this period, but is extremely likely to be still harboring the bacilli, in which case the child that was passively protected may now come down with the disease. Parents should be on the watch, therefore, for the first indication of infection, and upon the appearance of any illness, particularly if accompanied by a sore throat, should

send for the doctor immediately so that more antitoxin may be given.

It frequently happens that so-called "serum sickness" follows the injection of antitoxin within a few hours or sometimes not for several days thereafter. This condition with its train of symptoms consisting of fever, urticaria or hives, and sometimes joint symptoms, while disagreeable, perhaps even alarming, is not serious and is never fatal. The very small number of fatalities that have been associated with the administration of serums have not been from this cause. The possibility of serum sickness is one of the reasons why it is better not to use antitoxin routinely as a preventive measure. The passive immunization of children has its place in the family when the circumstances are such that the physician in attendance thinks it advisable. It has no place in the immunization of groups of children in schools for the reasons above mentioned, in addition to which it would be quite expensive on a large scale.

Toxin-antitoxin and toxoid.

The immunization of the horse for the purpose of obtaining antitoxin suggests the method of immunizing children. If small amounts of diphtheria toxin are injected, the child receiving the dose manufactures his own antitoxin and becomes immune to diphtheria. Moreover, he is now actively immune instead of passively as when antitoxin from the horse has been injected. That is to say, he has a natural immunity produced by his own body and this immu-

* This is the third article by Dr. Kellogg in a series upon this subject.

nity is permanent, not transitory as in the case of passive immunity.

Since diphtheria toxin would be irritating to the tissues if given straight, it is first neutralized with antitoxin which renders its use perfectly harmless, but still capable of producing immunity. Another method of denaturing the toxin is to change it by chemical means into toxoid. Both toxin-antitoxin and toxoid may in adults and older children cause some degree of local and occasionally systemic reaction. While these reactions are not dangerous, they are disagreeable. Therefore, children should receive their immune treatments if possible before they are ten years of age because in young children no symptoms whatever follow the injections. Children should be immunized as soon as they reach one year of age because of the death rate under five is high and if no immunizations were done until after five only half the number of lives will be saved as is possible by immunizing earlier.

Immunization with toxin-antitoxin or toxoid is not an emergency measure. It does not stamp out an epidemic to feverishly immunize all the children after the disease has appeared. That is locking the barn after the horse is stolen because it requires from three to six months for immunity to develop after the treatments are given.

One hears a good deal about anaphylaxis and hypersensitiveness in connection with the use of antitoxin for the cure and toxin-antitoxin for the prevention of diphtheria. The facts briefly are these:

- (1) Almost anybody is capable of getting serum sickness if the dose is large enough or given in the particular manner favoring its development.
- (2) Serum sickness is not serious however uncomfortable it may be.
- (3) Serum sickness is not caused by a previous administration of serum or of toxin-antitoxin. It follows the first dose of serum if the person is one of those specially subject to it, and all that a second dose at a later time can do is to result in an accelerated reaction. The time for the development of symptoms is short. Toxin-antitoxin, it should be noted, never gives rise to serum sickness.
- (4) There is, of course, a form of exaggerated hypersensitiveness that renders it necessary to use caution and to desensitize the patient when serum is to be administered. This exaggerated hypersensitiveness is very uncommon and is not produced by a previous dose of serum.
- (5) Toxin-antitoxin does not sensitize so that later administrations of serum would be dangerous.
- (6) Those who still fear sensitization will use

toxoid which can not by the wildest stretch of the imagination sensitize a child.

(To be continued)

WHY A SEASONAL QUARANTINE IS PLACED UPON MUSSELS AND CLAMS

Bicarbonate of Soda as a Factor in the Prevention of Mussel Poisoning

By H. MULLER, Ph.D., Instructor in Research Medicine,
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Each year, since 1927, the California Board of Public Health has established a quarantine on mussels during the summer months when these shellfish are toxic. Recently a similar quarantine has been placed upon clams because of a toxic condition that has been discovered in them. These quarantines, naturally, have resulted in protests from some of the individuals who are engaged in the commercial distribution of clams and mussels. It would seem to be in order, therefore, that the essential facts relative to the need for the exercise of quarantine measures be enumerated. Since the author of this article has been engaged in research work connected with the investigation of clams and mussels, his familiarity with every detail of the problem may entitle him to discuss the relationship between the scientific investigations and the practical measures that are concerned with the solutions of the many problems associated with the prevention of shellfish poisonings.

In 1927 an outbreak of mussel poisoning involving more than 100 cases constituted almost a catastrophe. Most of these cases occurred in San Francisco and its immediate vicinity. The California Board of Public Health established a quarantine on these shellfish shortly after the first cases had been reported and a scientific investigation was undertaken immediately by the Hooper Foundation for Medical Research of the University of California. This investigation has been carried on during each of the years which followed and is still in progress. Based upon findings which have been made available through this investigation the California Board of Public Health has established a permanent quarantine upon mussels which is in force during the summer months of each year.

No cases of mussel poisoning were reported in 1928 but in 1929 55 cases occurred. Protests against the quarantine measures were made by some of those who are interested commercially and blame was placed upon the inexperience of individuals who gather and prepare mussels for their tables. In 1930 only one

case of shellfish poisoning was reported and in 1931 there were but two cases. Laboratory tests performed during both of these years showed a remarkable toxicity to animals, however. It was apparent that many individuals had eaten toxic mussels at this time and apparently without any physical harm. It became evident, also, that mussels and clams varied in toxicity and the toxicity did not reach a height every year which might render them dangerous for human consumption. The advisability of the establishment of a permanent quarantine on shellfish was questioned, but the appearance of 42 cases during 1932 demonstrated the necessity of the quarantine. The further discussion in this paper is concerned with the practical reasons which have necessitated this action.

During the toxic season of 1932 the concentration of the poison dangerous for consumption by human beings could be determined for the first time with sufficient certainty. A chemical investigation of the poison has also revealed facts which should become of common knowledge. This paper is not intended to present an outline of the research work that has been done, but it is intended to point out certain facts which should be considered in establishing quarantine measures during coming years.

By careful observation it has been determined that individuals who gather shellfish may be divided into two groups: first, that comprising individuals who know that it is dangerous to use shellfish which are gathered at certain seasons of the year but who do not make use of the information; second, the group of individuals who do not know of the danger which lies in the consumption of these shellfish at certain seasons but who would pay attention to warnings. From personal experience it is known that the second group of individuals, those who have no information on the subject, is the larger group. Little can be done to determine the actions of the first group, but the second group might be brought under control through a more intensive campaign of education. Newspaper publicity is valuable but there might be more action in issuing warnings at the largest and most frequently visited mussel-beds along the coast, from Monterey to Mendocino counties. Perhaps the placement of warning signs might be of some value. Such procedure might be expensive, but it certainly would not cost more than the hospital treatment of patients who may be made ill through the consumption of poisonous shellfish.

It should be more generally known that the usual methods of preparing mussels for eating by means of steaming, cooking, baking, etc., does not lessen the danger of poisoning. As a matter of fact, the

water in which shellfish may be cooked takes up the major part of the poison. If the broth is not discarded the danger of poisoning is increased because of the quicker resorption of the liquid. The popular belief that cooking lessens the danger of poisoning and also the belief that the blackening of a silver coin can be used as an indicator for the presence of poison are both mistaken beliefs. Furthermore, the treatment of shellfish poisoning with alcohol is very dangerous because the poison is most readily soluble in alcohol.

Recent experiments have shown that there is a rather simple method by which mussels may be made safer to eat. The addition of one-quarter ounce (1 tablespoon) of bicarbonate of soda to each quart of water in which the shellfish are cooked destroys 85 per cent of the poison when the cooking process is continued for twenty to thirty minutes. The use of this procedure causes the major part of the poison to lose its dangerous effect. This experiment is in agreement with results that were secured by Salkowski when an outbreak of mussel poisoning occurred in Wilhelmshaven, Germany, in 1885. That the same type of poison is involved in the California outbreaks as was involved in the Wilhelmshaven outbreak has not been established up to the present time however. Cooking shellfish with bicarbonate of soda does not grant a complete protection from poisoning (the coagulation, protein substances retain about 15 per cent of the poison in the tissue which is only delivered by the digestion in the stomach) but it provides partial protection.

The results of this experiment, however, give rise to the question as to whether the quarantine on shellfish can not be limited to a short period of time. Investigations carried on during the last five years show that a small amount of poison can be found in mussels or clams during almost every month of the year, but not in quantities which are harmful to human beings under ordinary circumstances. The amount of the poison increases during the summer months and reaches a maximum which in some years may be as early as June or as late as September. It should become a general custom to cook mussels with the addition of bicarbonate of soda, although there is a possibility that during highly toxic periods the use of bicarbonate of soda might not provide sufficient protection. A quarantine measure might then be restricted to cover only the periods of extreme toxicity, the determination of which could be made by laboratory tests.

Because of the fact that the occurrence of the poison in clams does not run strictly parallel to its occurrence in mussels it is more difficult to convince

most people that clams are often just as toxic as mussels. In both cases the poison is confined almost entirely to the intestines of the bivalve and since these organs are larger in clams they are usually discarded. For that reason, poisonings due to clams have occurred less frequently. Some individuals use the whole clam in making chowder. Under such conditions the danger is just as great as is that in poisonous mussels. If the intestines were always removed from clams the danger of contracting poisoning from this shellfish would be lessened greatly.

In spite of intensive investigations, made from every possible angle, knowledge relative to the causes of this temporary appearance of a strong poison in Pacific Coast shellfish is still incomplete. It is certain that mussels and clams are valuable foods, especially to people who live along the coast. There should be no fear in the eating of these shellfish, provided that the general public is well informed relative to certain dangers connected with these shellfish at certain seasons of the year. A more widespread campaign of education should be undertaken not only in newspapers but by means of outdoor signs, pamphlets, cook books, public school instruction and by means of other avenues of publicity and information. Everyone who uses shellfish should know how to prepare them properly for eating; they should use bicarbonate of soda, as prescribed, in cooking mussels; and they should always discard the intestines and clean clams before eating them. Furthermore, they should always respect a quarantine measure which may be established, with full assurance that it is a necessity for the protection of human life. If these procedures were followed consistently the danger of shellfish poisonings on the Pacific Coast could be greatly reduced, if not entirely eliminated.

He sleeps well who knows not that he sleeps ill.—Maxim.

Medicine absorbs the physician's whole being because it is concerned with the entire human organism.—Goethe.

MORBIDITY*

Diphtheria.

49 cases of diphtheria have been reported. Those communities reporting 10 or more cases are as follows: Los Angeles 16.

Measles.

18 cases of measles have been reported, the cases being scattered over the State.

* From reports received on September 26th and 27th for week ending September 24th.

Scarlet Fever.

62 cases of scarlet fever have been reported. Those communities reporting 10 or more cases are as follows: Los Angeles 11.

Whooping Cough.

229 cases of whooping cough have been reported. Those communities reporting 10 or more cases are as follows: Oakland 19, Los Angeles County 29, Los Angeles 51, Fullerton 12, San Diego 15, San Francisco 33.

Smallpox.

4 cases of smallpox have been reported, as follows: Glendale 3, San Jose 1.

Typhoid Fever.

5 cases of typhoid fever have been reported, as follows: Fresno County 2, Los Angeles County 1, San Bernardino County 1, California 1.**

Anthrax.

One case of anthrax from San Luis Obispo County has been reported.

Meningitis (Epidemic).

2 cases of epidemic meningitis have been reported, as follows: Amador County 1, San Francisco 1.

Poliomyelitis.

3 cases of poliomyelitis have been reported, as follows: San Francisco 2, California 1.**

Food Poisoning.

17 cases of food poisoning have been reported, as follows: Berkeley 3, Long Beach 2, Los Angeles 12.

Undulant Fever.

2 cases of undulant fever have been reported, as follows: Los Angeles 1, San Marino 1.

Relapsing Fever.

One case of relapsing fever from Placer County has been reported.

** Cases charged to "California" represent patients ill before entering the State or those who contracted their illness traveling about the State throughout the incubation period of the disease. These cases are not chargeable to any one locality.

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